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09/748,141	12/27/2000	Yoshihisa Abe	44319-056	3302

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EXAMINER
MCCARTNEY, LINZY T

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2671	

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Please find below and/or attached an Office communication concerning this application or proceeding.

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) ☒ Responsive to communication(s) filed on *17 April 2003* .

2a) ☐ This action is **FINAL.**   2b) ☒ This action is non-final.

3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) ☒ Claim(s) *1-22* is/are pending in the application.

   4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5) ☐ Claim(s) _____ is/are allowed.

6) ☒ Claim(s) *1,3-8,14,15 and 17-22* is/are rejected.

7) ☐ Claim(s) *2,9-13 and 16* is/are objected to.

8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) ☐ The specification is objected to by the Examiner.

10) ☒ The drawing(s) filed on *27 December 2000* is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.

   Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.

   If approved, corrected drawings are required in reply to this Office action.

12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   a) ☒ All b) ☐ Some * c) ☐ None of:

   1. ☒ Certified copies of the priority documents have been received.

   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .

   3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

   * See the attached detailed Office action for a list of the certified copies not received.

14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

   a) ☐ The translation of the foreign language provisional application has been received.

15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .

4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2.   Claims 1, 3, 8, and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable

over Garland et al., "*Surface Simplification Using Quadric Error Metrics*" (Garland) in

view of U.S. Patent No. 5,590,248 to Zarge et al. (Zarge).

a.   Referring to claim 1, Garland discloses calculating estimation values for

surfaces to be deformed by shrinking edges or surfaces of a polygon model by

converging two or more vertices of the polygon model based on distances

between the respective surfaces and all the original vertices involved in the

surface deformation, ("...We can associate a set of planes...we can define the

error of the vertex with respect to this set as the sum of squared distances to it

planes..." – page 4, paragraph 1 and "...Compute the Q matrices for all initial

vertices...The error...of this target vertex becomes the cost of contracting this

pair...place all the pairs in a heap keyed on cost..." – page 3, Section 4.1,

paragraph 2) and reducing the number of data for the polygon model by shrinking

edges or surfaces of the polygon model ("...Iteratively remove the pair...contract

this pair..."-- – page 3, Section 4.1, paragraph 2 and Figure 1). Garland does not

expressly disclose comparing the calculated estimation values with a

predetermined permissible value or reducing the number of data when the

estimation values are equal to or below the predetermined permissible value.

Zarge discloses a method for reducing the complexity of a polygonal mesh by

comparing a calculated estimation value with a predetermined permissible value

and reducing the number of data when the estimation values are equal to or below

the predetermined permissible value ("...if the distance is less than a pre-selected

decimation threshold..." – column 3, line 7-12 and Fig. 1). At the time the

invention was made, it would have been obvious to a person of ordinary skill in

the art to modify the method of Garland to compare the calculated estimation

values with a predetermined permissible value and reduce the number of data

when the estimation values are equal to or below the predetermined permissible

value as taught by Zarge because it would allow the user to specify a target

reduction ("The user can specify the target reduction..." – Zarge, column 4, lines

49-56).

b.   Referring to claim 3, Garland discloses the polygon model includes a

number of triangular polygons ("We assume that the model consists of triangles

only..." – page 1, paragraph 4).

c.   Claim 8 is rejected with the rationale of the rejection of claim 1. Claim 8 is

merely claim 1 recited as an apparatus.

d.   Claim 14 is rejected per claim 8 with the rationale of the rejection of claim

3. Claim 14 is merely claim 3 recited as an apparatus.

3.   Claims 4-7, 15, 17-19, and 21-22 are rejected under 35 U.S.C. 103(a) as being

unpatentable over Garland in view of U.S. Patent No. 6,262,737 to Li et al. (Li).

a.   Referring to claim 4, Garland discloses calculating respective estimation

values for a plurality of portions of a polygon model that are to be deformed by

converging two or more vertices of the polygon model ("...Compute the Q

matrices for all initial vertices...The error...of this target vertex becomes the cost

of contracting this pair..." – page 3, Section 4.1, paragraph 2) and reducing the

number of data for the polygon model by converging two or more vertices of one

portion of the polygon model based on the calculated estimation values after

another portion, repeatedly ("...Iteratively remove the pair...contract this pair..."

– page 3, Section 4.1, paragraph 2 and Figure 1). Garland does not disclose

wherein before each data reduction, the portion that the estimation value thereof is

necessary to be recalculated as a result of the previous data reductions is defined

as a reduction prohibition area, and a succeeding data reduction is applied to a

portion other than the reduction prohibition area. Li discloses performing

independent edge collapses, i.e. edge collapses that do not share a vertex ("...two

edge collapse operations...are independent of each other if they do not share any

common vertex...a mesh simplification may be conducted...where independent

edge collapses are performed in the same layer..." – column 12, lines 22-35).

Inherently, to ensure the aforementioned edge collapses are independent they

must be marked in some fashion. Note that in the method of Garland, the

estimation values are only recalculated for those portions previously involved in a

removal ("...contract this pair, and update the costs of all pairs involving v_1..." –

page, 3, column 2, paragraph 4). At the time the invention was made, it would

have been obvious to a person of ordinary skill in the art to modify the method of

Garland to perform independent edge collapses as taught by Li. The

suggestion\motivation for doing so would have been to force pair contractions to

be spread evenly over the surface of the model to ensure the model is simplified

across its entire surface in a balanced way (Li, column 12, lines 32-35).

b.   Claim 5 is rejected per claim 4. The modified method of Garland as

applied to claim 4 meets the limitations recited in claim 5 except "…wherein the

reduction prohibition area is released if a predetermined condition is satisfied."

Li discloses that mesh simplification is performed on several consecutive layers

and independent edge collapses are performed in the same layer ("…mesh

simplification may be conducted through several consecutive

layers…independent edge collapses are performed in the same layer…" – column

12, lines 28-30), so upon simplification of each layer the prohibition area is

released. At the time the invention was made, it would have been obvious to a

person of ordinary skill in the art to modify the method of Garland to release the

reduction prohibition area if a predetermined condition is satisfied as taught by Li.

The suggestion\motivation for doing so would have been to force pair

contractions to be spread evenly over the surface of the model to ensure the model

is simplified across its entire surface in a balanced way (Li, column 12, lines 32-

35).

c.   Claims 6 and 7 are rejected per claim 5. The modified method of Garland

as applied to claim 5 meets the limitations recited in claims 6 and 7. As noted in

the rejection of claim 5 above the reduction prohibition area is lifted after all

vertices have been processed for a particular layer which meets the limitations recited in claims 6 and 7.

d.   Referring to claim 15, Garland discloses an estimation calculator which calculates respective estimation values for a plurality of portions of a polygon model that are to be deformed by converging two or more vertices of the polygon model ("...Compute the Q matrices for all initial vertices...The error...of this target vertex becomes the cost of contracting this pair..." – page 3, Section 4.1, paragraph 2; "...an SGI Indigo2 with a 195 MHz R10000 processor and 128 Mbytes of memory." – page 5, footnote), a judging device which judges based on a calculated estimated value whether a portion of the polygon model is permissible for the deformation ("...iteratively remove the pair (v_1, v_2) of least cost from the heap..."; "...an SGI Indigo2 with a 195 MHz R10000 processor and 128 Mbytes of memory." – page 5, footnote), and a data reducing device which reduces the number of data for the polygon model by converging two or more vertices of one portion of the polygon model based on the calculated estimation values after another portion, repeatedly ("...Iteratively remove the pair...contract this pair..." – page 3, Section 4.1, paragraph 2 and Figure 1; "...an SGI Indigo2 with a 195 MHz R10000 processor and 128 Mbytes of memory." – page 5, footnote). Garland does not disclose a prohibition area defining device which defines a portion that the estimation value thereof is necessary to be recalculated as a result of the previous data reductions is defined as a reduction prohibition area, and a succeeding data reduction is applied to a portion other than the reduction prohibition area to keep succeeding data reduction from being applied.

Li discloses performing independent edge collapses, i.e. edge collapses that do not

share a vertex ("...two edge collapse operations...are independent of each other if

they do not share any common vertex...a mesh simplification may be

conducted...where independent edge collapses are performed in the same

layer..." – column 12, lines 22-35). Inherently, to ensure the aforementioned edge

collapses are independent they must be marked in some fashion. Note that in the

method of Garland, the estimation values are only recalculated for those portions

previously involved in a removal ("...contract this pair, and update the costs of all

pairs involving v_1..." – page, 3, column 2, paragraph 4). At the time the invention

was made, it would have been obvious to a person of ordinary skill in the art to

modify the method of Garland to perform independent edge collapses as taught by

Li. The suggestion\motivation for doing so would have been to force pair

contractions to be spread evenly over the surface of the model to ensure the model

is simplified across its entire surface in a balanced way (Li, column 12, lines 32-

35).

e.   Claim 17 is rejected per claim 15 with the rationale of the rejection of

claim 5. Claim 17 is merely claim 5 recited as an apparatus.

f.   Claim 18 is rejected per claim 17 with the rationale of the rejection of

claim 6. Claim 18 is merely claim 6 recited as an apparatus.

g.   Claim 19 is rejected per claim 17 with the rationale of the rejection of

claim 7. Claim 19 is merely claim 7 recited as an apparatus.

h.   Referring to claim 21, Garland discloses the portion to be converged is an

edge of a triangular polygon ("Our simplification algorithm is based on the

iterative contraction of vertex pairs…" – page 2, column 2, paragraph 3 and

Figure 10).

    i.   Referring to claim 22, Garland discloses the portion to be converged is a

surface of a triangular polygon (Figure 1).

4.   Claim 20 is rejected under 35 U.S.C. 103(a) as being unpatentable over Garland

in view of Li as applied to claim 15 above further in view of Zarge.

    a.   Referring to claim 20, Garland discloses a minimum estimation value

calculator which calculates a minimum estimation value (page 3, column 2,

paragraph 4; page 5, footnote). Garland does not explicitly discloses a comparator

which compares the minimum estimation value with a permissible value; and a

determiner which determines a portion having the minimum estimation value as a

portion to be converged when the minimum estimation value is equal or below the

permissible value. Zarge discloses a comparator which compares the estimation

value with a permissible value; and a determiner which determines a portion

having the estimation value as a portion to be converged when the minimum

value is equal or below the permissible value (column 3, line 7-12 and Fig. 1). At

the time the invention was made, it would have been obvious to a person of

ordinary skill in the art to modify the apparatus of Garland with a comparator

which compares the calculated estimation values with a predetermined

permissible value and a determiner which determines a portion having a

estimation value as a portion to be converged when the minimum estimation value

is equal or below the permissible value as taught by Zarge because it would allow

the user to specify a target reduction ("The user can specify the target

reduction..." – Zarge, column 4, lines 49-56).

Allowable Subject Matter

5.   Claims 2, 9-13, and 16 are objected to as being dependent upon a rejected base

claim, but would be allowable if rewritten in independent form including all of the

limitations of the base claim and any intervening claims.

Response to Arguments

6.   Applicant's arguments filed 17 April 2003 have been fully considered but they are

not persuasive. Applicant argues that Garland does not disclose that estimation is made

based on the distances between the respective surfaces of the polygon model before

approximation and the vertices of the polygon model after approximation, however such

a limitation is not recited in the claims. The Examiner reminds the Applicant that while

the claims are read in light of the Specification, limitations from the Specification cannot

be read into the claims. The Applicant also argues that Garland in view of Li fails to

teach the recalculated estimation values are defined as reduction prohibition area. As

noted in the rejection above Garland recalculating the estimation value of a edge that has

been involved in a contraction (page 3, column 2, paragraph 4) and Li discloses

performing independent edge collapses, i.e. edge collapses that do not share a vertex

(column 12, lines 22-35). Inherently, to ensure the aforementioned edge collapses are

independent they must be marked in some fashion.

Conclusion

Any inquiry concerning this communication or earlier communications from the

examiner should be directed to **Linzy McCartney** whose telephone number is **(703) 605-**

0745. The examiner can normally be reached on Mon-Friday (8:00AM-5: 30PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, **Mark Zimmerman**, can be reached at **(703) 305-9798**.

Any response to this action should be mailed to:

Commissioner of Patents and Trademarks

Washington, D.C. 20231

or faxed to:

(703) 872-9314 (for Technology Center 2600 only)

Hand-delivered responses should be brought to Crystal Park II, 2121 Crystal

Drive, Arlington, VA, Sixth Floor (Receptionist).

Any inquiry of a general nature or relating to the status of this application or

proceeding should be directed to the Technology Center 2600 Customer Service

Office whose telephone number is (703) 306-0377.

ltm
June 23, 2003

MARK ZIMMERMAN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600